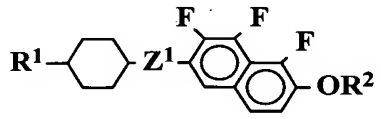
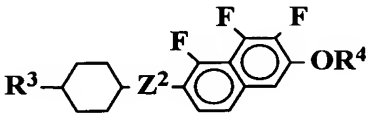
Amendment under Article 34

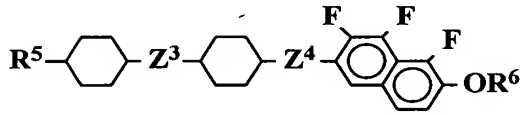
CLAIMS

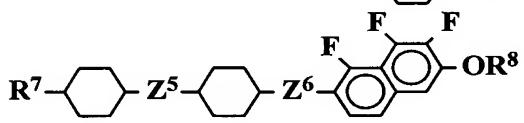
1. (currently amended) A nematic liquid crystal composition comprising at least one compound selected from the group of compounds represented by the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1) and (IB-3), the total content being from 10 to 40% by mass, at least one compound selected from the group of compounds represented by the general formulas (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3), (IIB-5), (IIC), (IIC-3), (IIC-7), (IIC-9), (IIC-10) and (IID), the total content being from 10 to 70% by mass, the content of the compound represented by the general formula (IIC), (IIC-3), (IIC-7), (IIC-9) and (IIC-10) being from 10 to 40% by mass, the total content of the compounds selected from the group of compounds represented by the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1), (IB-3), (IIC), (IIC-3), (IIC-7), (IIC-9) and (IIC-10) being from 45 to 70% by mass, the total content of at least one compound selected from the group of compounds represented by the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1), (IB-3), (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3), (IIB-5), (IIC), (IIC-3), (IIC-7), (IIC-9), (IIC-10) and (IID) being from 35 to 80% by mass, and a compound represented by the general formula (III) in the content of 20 to 65% by mass, wherein a dielectric constant anisotropy is within a range from -12 to -3, a nematic phase-

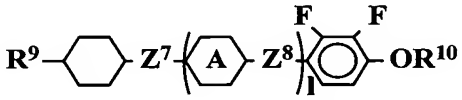
isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C, and a viscosity is 45 mPa·s or less:

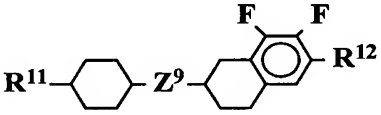
(IA) 

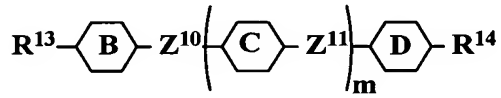
(IB) 

(IIA) 

(IIB) 

(IIC) 

(IID) 

(III) 

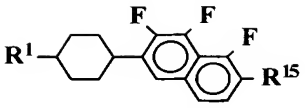
wherein R^1, R^3, R^5, R^7, R^9, R^{11}, R^{12}, R^{13} and R^{14} each independently represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one, or two or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly;

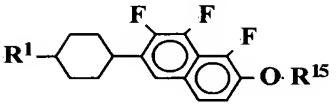
R^2, R^4, R^6, R^8 and R^{10} each independently represents an alkyl group having 1 to 10 carbon atoms, or an alkenyl group having 2 to 10 carbon atoms, and one, or two or more CH_2 groups,

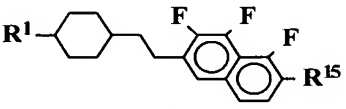
which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly; and

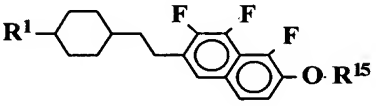
Z^1 to Z^6 and Z^9 to Z^{11} each independently represents a single bond, $-CH_2CH_2-$, $-CH=CH-$, $-CH_2CH_2CH_2CH_2-$, $-CH_2CH_2CH_2O-$, $-OCH_2CH_2CH_2-$, $-CH=CHCH_2CH_2-$, $-CH_2CH_2CH=CH-$, $-C\equiv C-$, $-CH_2O-$, $-OCH_2-$, $-CF_2O-$, $-COO-$, or $-OCO-$; Z^7 and Z^8 each independently represents a single bond, $-CH_2CH_2-$, $-CH=CH-$, $-CH_2CH_2CH_2CH_2-$, $-CH_2CH_2CH_2O-$, $-OCH_2CH_2CH_2-$, $-CH=CHCH_2CH_2-$, $-CH_2CH_2CH=CH-$, $-C\equiv C-$, $-CH_2O-$, or $-OCH_2-$; l and m represents 0 or 1; A represents a trans-1,4-cyclohexylene group or a 1,4-phenylene group; and B, C and D each independently represents a trans-1,4-cyclohexylene group, a 1,4-phenylene group, or a trans-1,4-cyclohexenylene group,

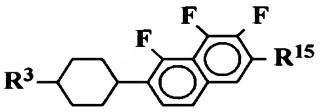
and

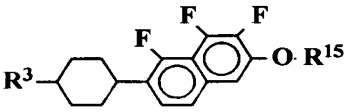
(IA-1) 

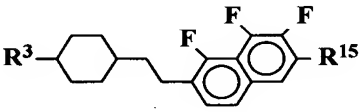
(IA-2) 

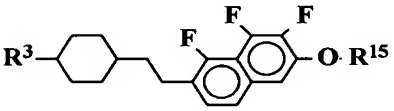
(IA-3) 

(IA-4) 

(IB-1) 

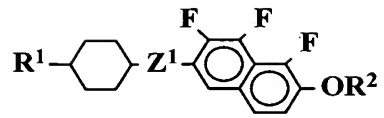
(IB-2) 

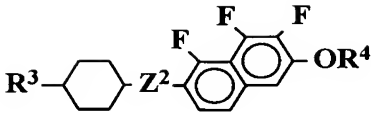
(IB-3) 

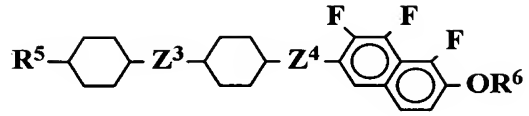
(IB-4) 

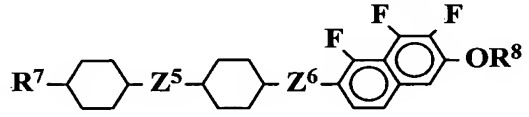
wherein R^1 and R^3 represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly; and R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

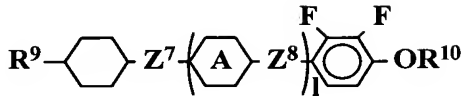
2. (currently amended) A nematic liquid crystal composition comprising at least one compound selected from the group of compounds represented by the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1) and (IB-3), the total content being from 25 to 60% by mass, at least one compound selected from the group of compounds represented by the general formulas (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3), (IIB-5), (IIC), (IIC-3), (IIC-7), (IIC-9), (IIC-10) and (IID), the total content being from 10 to 70% by mass, the total content of the compounds selected from the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1), (IB-3), (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3) and (IIB-5), being from 35 to 65% by mass, the total content of at least one compound selected from the group of compounds represented by the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1), (IB-3), (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3), (IIB-5), (IIC), (IIC-3), (IIC-7), (IIC-9), (IIC-10) and (IID) being from 35 to 80% by mass, and a compound represented by the general formula (III) in the content of 35 to 65% by mass, wherein a dielectric constant anisotropy is within a range from -12 to -3, a nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120, and a viscosity is 45 mPa·s or less:

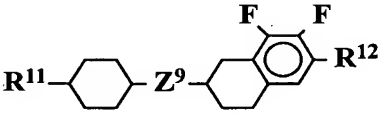
(IA) 

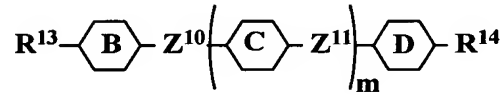
(IB) 

(IIA) 

(IIB) 

(IIC) 

(IID) 

(III) 

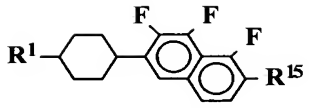
wherein R^1, R^3, R^5, R^7, R^9, R^{11}, R^{12}, R^{13} and R^{14} each independently represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one, or two or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly;

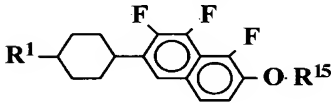
R^2, R^4, R^6, R^8 and R^{10} each independently represents an alkyl group having 1 to 10 carbon atoms, or an alkenyl group having 2 to 10 carbon atoms, and one, or two or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not

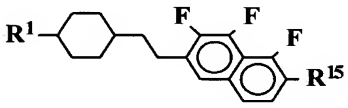
bond with each other directly; and

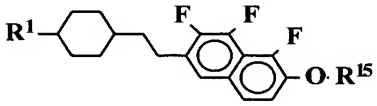
Z^1 to Z^6 and Z^9 to Z^{11} each independently represents a single bond, $-CH_2CH_2-$, $-CH=CH-$, $-CH_2CH_2CH_2CH_2-$, $-CH_2CH_2CH_2O-$, $-OCH_2CH_2CH_2-$, $-CH=CHCH_2CH_2-$, $-CH_2CH_2CH=CH-$, $-C\equiv C-$, $-CH_2O-$, $-OCH_2-$, $-CF_2O-$, $-COO-$, or $-OCO-$; Z^7 and Z^8 each independently represents a single bond, $-CH_2CH_2-$, $-CH=CH-$, $-CH_2CH_2CH_2CH_2-$, $-CH_2CH_2CH_2O-$, $-OCH_2CH_2CH_2-$, $-CH=CHCH_2CH_2-$, $-CH_2CH_2CH=CH-$, $-C\equiv C-$, $-CH_2O-$, or $-OCH_2-$; l and m represent 0 or 1; A represents a trans-1,4-cyclohexylene group or a 1,4-phenylene group; and B, C and D each independently represents a trans-1,4-cyclohexylene group, a 1,4-phenylene group, or a trans-1,4-cyclohexenylene group,

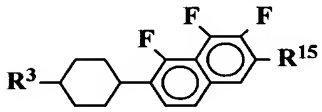
and

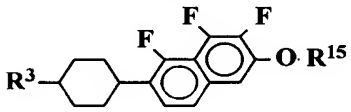
(IA-1) 

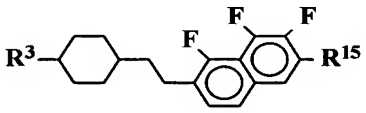
(IA-2) 

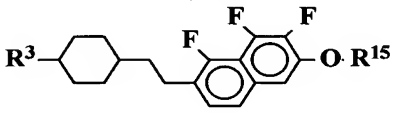
(IA-3) 

(IA-4) 

(IB-1) 

(IB-2) 

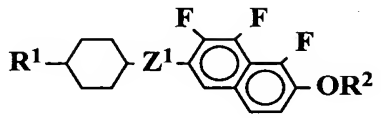
(IB-3) 

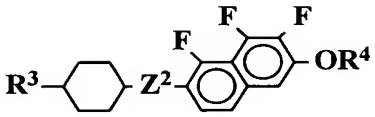
(IB-4) 

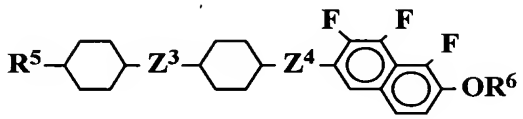
wherein R^1 and R^3 represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly; and R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

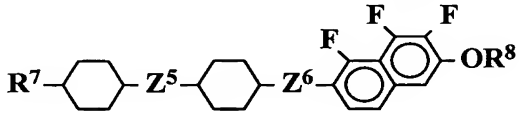
3. (currently amended) A nematic liquid crystal composition comprising at least one compound selected from the group of compounds represented by the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1) and (IB-3), the total content being from 20 to 70% by mass, at least one compound selected from the group of compounds represented by the general formulas (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3), (IIB-5), (IIC), (IIC-3), (IIC-7), (IIC-9), (IIC-10) and (IID), the total content being from 10 to 70% by mass, the total content of the compounds selected from the group of compounds selected from the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1), (IB-3), (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3) and (IIB-5), being from 20 to 60% by mass, the total content of the compounds selected from the group of compounds represented by the general formulas (IIC), (IIC-3), (IIC-7), (IIC-9), (IIC-10) and (IID) being from 30 to 60% by mass, the total content of the compounds selected from the group of compounds represented by the general formulas (IA), (IA-1), (IA-3), (IB), (IB-1), (IB-3), (IIA), (IIA-1), (IIA-3), (IIA-5), (IIB), (IIB-1), (IIB-3), (IIB-5), (IIC), (IIC-3), (IIC-7), (IIC-9), (IIC-10) and (IID) being from 70 to 80% by mass, and a compound represented by the general formula (III) in the content of 20 to 65% by mass, wherein a dielectric constant anisotropy is within a range from -12 to -3, a nematic phase-isotropic liquid phase transition temperature

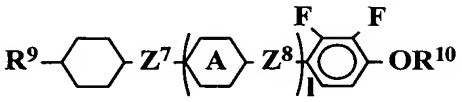
(T_{N-I}) is within a range from 80 to 120°C, and a viscosity is 45 mPa·s or less:

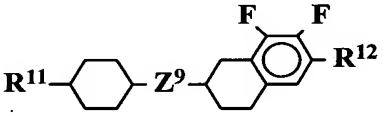
(IA) 

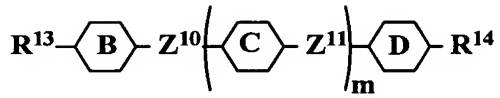
(IB) 

(IIA) 

(IIB) 

(IIC) 

(IID) 

(III) 

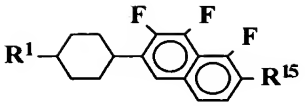
wherein R^1, R^3, R^5, R^7, R^9, R^{11}, R^{12}, R^{13} and R^{14} each independently represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one, or two or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly;

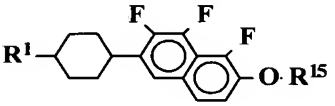
R^2, R^4, R^6, R^8 and R^{10} each independently represents an alkyl group having 1 to 10 carbon atoms, or an alkenyl group having 2 to 10 carbon atoms, and one, or two or more CH_2 groups,

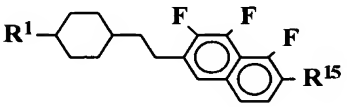
which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly; and

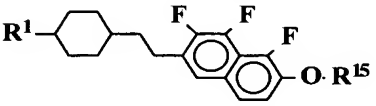
Z^1 to Z^6 and Z^9 to Z^{11} each independently represents a single bond, $-CH_2CH_2-$, $-CH=CH-$, $-CH_2CH_2CH_2CH_2-$, $-CH_2CH_2CH_2O-$, $-OCH_2CH_2CH_2-$, $-CH=CHCH_2CH_2-$, $-CH_2CH_2CH=CH-$, $-C\equiv C-$, $-CH_2O-$, $-OCH_2-$, $-CF_2O-$, -COO-, or -OCO-; Z^7 and Z^8 each independently represents a single bond, $-CH_2CH_2-$, $-CH=CH-$, $-CH_2CH_2CH_2CH_2-$, $-CH_2CH_2CH_2O-$, $-OCH_2CH_2CH_2-$, $-CH=CHCH_2CH_2-$, $-CH_2CH_2CH=CH-$, $-C\equiv C-$, $-CH_2O-$, or $-OCH_2-$; l and m represent 0 or 1; A represents a trans-1,4-cyclohexylene group or a 1,4-phenylene group; and B, C and D each independently represents a trans-1,4-cyclohexylene group, a 1,4-phenylene group, or a trans-1,4-cyclohexenylene group,

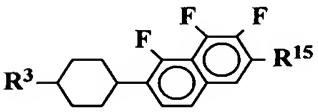
and

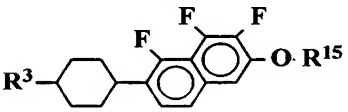
(IA-1) 

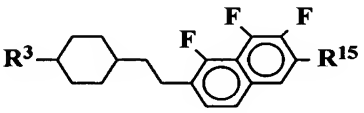
(IA-2) 

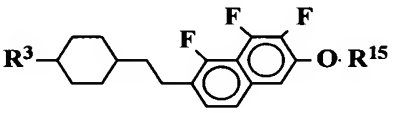
(IA-3) 

(IA-4) 

(IB-1) 

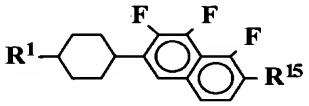
(IB-2) 

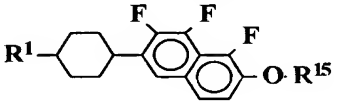
(IB-3) 

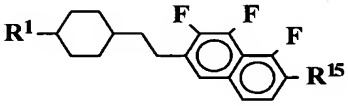
(IB-4) 

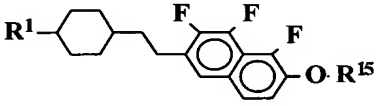
wherein R^1 and R^3 represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly; and R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

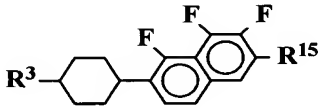
4. (currently amended) The nematic liquid crystal composition according to claim 1, 2 or 3, wherein the compound represented by the general formula (IA) comprises compounds represented by the general formulas (IA-2) or (IA-4), and the compound represented by the general formula (IB) comprises compounds represented by the general formulas (IB-2) or (IB-4):

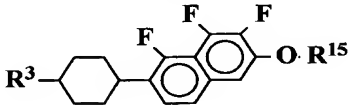
(IA-1) 

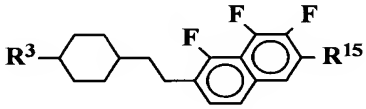
(IA-2) 

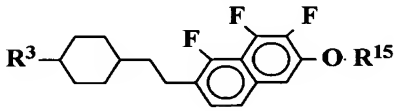
(IA-3) 

(IA-4) 

(IB-1) 

(IB-2) 

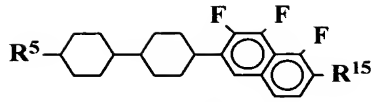
(IB-3) 

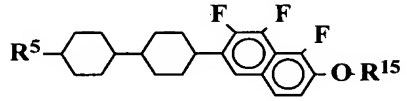
(IB-4) 

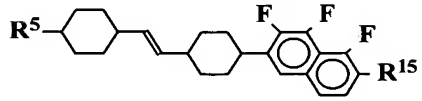
wherein R^1 and R^3 represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy

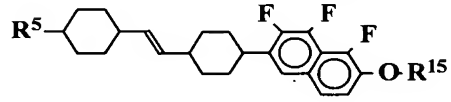
group having 2 to 10 carbon atoms, and one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly; and R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

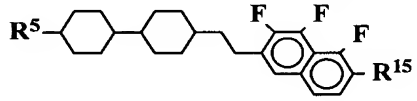
5. (currently amended) The nematic liquid crystal composition according to claim 1, 2 or 3, wherein the compound represented by the general formula (IIA) comprises compounds represented by the general formulas (IIA-2), (IIA-4) or (IIA-6), and the compound represented by the general formula (IIB) comprises compounds represented by the general formulas (IIB-2), (IIB-4) or (IIB-6):

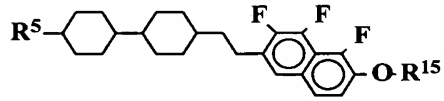
(IIA-1) 

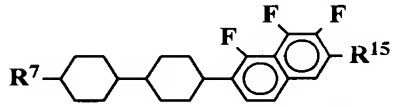
(IIA-2) 

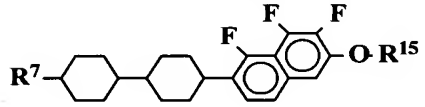
(IIA-3) 

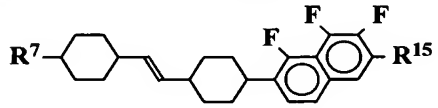
(IIA-4) 

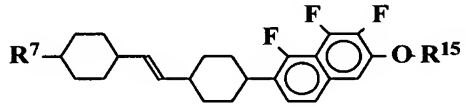
(IIA-5) 

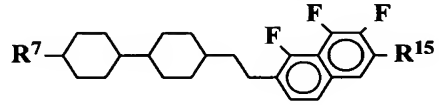
(IIA-6) 

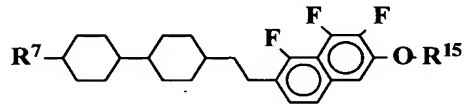
(IIB-1) 

(IIB-2) 

(IIB-3) 

(IIB-4) 

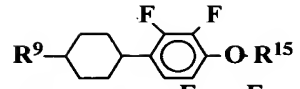
(IIB-5) 

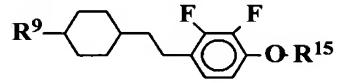
(IIB-6) 

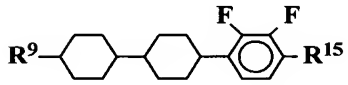
wherein R^5 and R^7 represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, one or more CH_2 groups, which are present in said alkyl group, said alkoxy group,

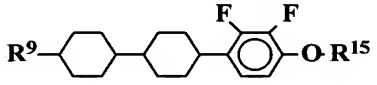
said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly, and each substituent preferably represents an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, and the alkenyl group is particularly preferably a vinyl group, 1-propenyl group, or a 3-butenyl group, and R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

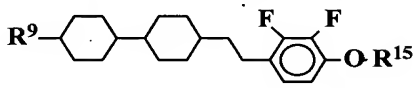
6. (currently amended) The nematic liquid crystal composition according to claim 1, 2 or 3, wherein the compound represented by the general formula (IIC) comprises compounds represented by the general formulas (IIC-1), (IIC-2), (IIC-4), (IIC-5), (IIC-6) or (IIC-8):

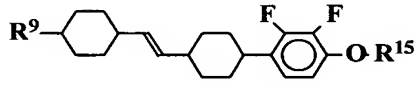
(IIC-1) 

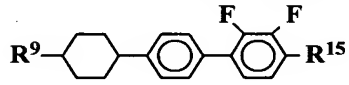
(IIC-2) 

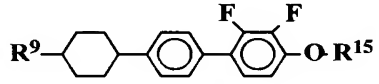
(IIC-3) 

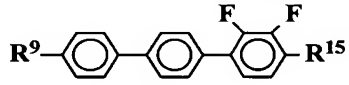
(IIC-4) 

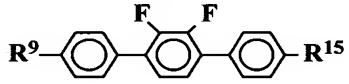
(IIC-5) 

(IIC-6) 

(IIC-7) 

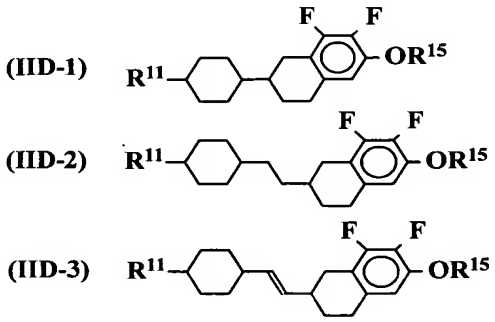
(IIC-8) 

(IIC-9) 

(IIC-10) 

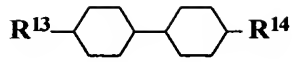
wherein R^9 represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one or more CH_2 groups, which are represent in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO-, or -COO-, while O atoms do not bond with each other directly, and R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

7. (previously amended) The nematic liquid crystal composition according to claim 1, 2 or 3, wherein the compound represented by the general formula (IID) comprises compounds represented by the general formulas (IID-1) to (IID-3):

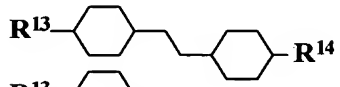


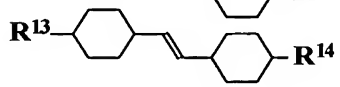
wherein R^{11} represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly, the substituent preferably represents an alkyl group having 1 to 5 carbon atoms, or an alkenyl group having 2 to 5 carbon atoms, and the alkenyl group is particularly preferably a vinyl group, a 1-propenyl group, or a 3-butenyl group, and R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

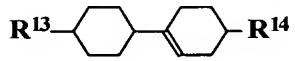
8. (previously amended) The nematic liquid crystal composition according to claim 1, 2 or 3, wherein the compound represented by the general formula (III) comprises compounds represented by the general formulas (III-1) to (III-22):

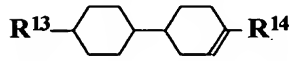
(III-1) 

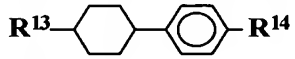
(III-2) 

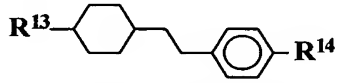
(III-3) 

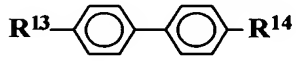
(III-4) 

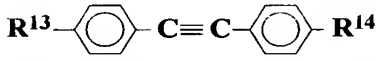
(III-5) 

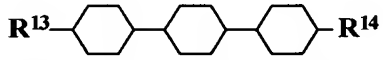
(III-6) 

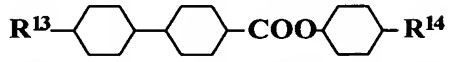
(III-7) 

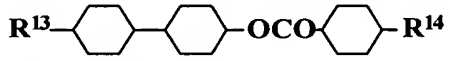
(III-8) 

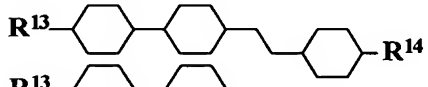
(III-9) 

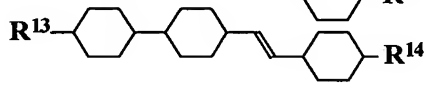
(III-10) 

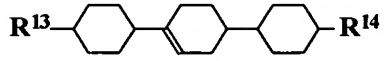
(III-11) 

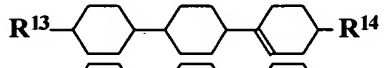
(III-12) 

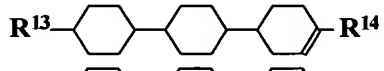
(III-13) 

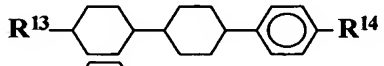
(III-14) 

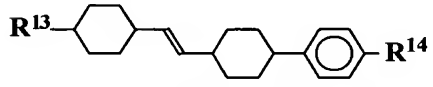
(III-15) 

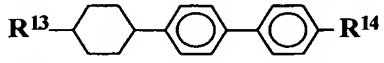
(III-16) 

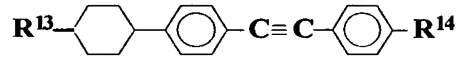
(III-17) 

(III-18) 

(III-19) 

(III-20) 

(III-21) 

(III-22) 

wherein R^{13} and R^{14} represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an

alkenyl group having 2 to 10 carbon atom, or an alkenyloxy group having 2 to 10 carbon atoms, one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly, each substituent independently represents an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, preferably, and the alkenyl group is particularly preferably a vinyl group, a 1-propenyl group, or a 3-butenyl group.

9. (Canceled)

10. (previously amended) The nematic liquid crystal composition according to any one of claims 4 to 8, wherein the dielectric constant anisotropy is within a range from -6 to -3,

the nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C,

the refractive index anisotropy is within a range from 0.07 to 0.15, and

the viscosity is 30 mPa·s or less.

11. (previously amended) The nematic liquid crystal composition according to any one of claims 4 to 8, wherein

the dielectric constant anisotropy is within a range from -6 to -3,

the nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C,

the refractive index anisotropy is within a range from 0.07 to 0.15, and

the viscosity is 30 mPa·s or less.

12. (previously amended) The nematic liquid crystal composition according to any one of claims 4 to 8, wherein the dielectric constant anisotropy is within a range from -12 to -6,

the nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C,

the refractive index anisotropy is within a range from 0.07 to 0.15, and

the viscosity is 45 mPa·s or less.

13. A liquid crystal display device for active matrix display, using the nematic liquid crystal composition according to any one of claims 1 to 12.

14. A liquid crystal display device for VA mode, IPS mode or ECB mode, using the nematic liquid crystal composition according to any one of claims 1 to 12.